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Author(s): Anaya, Lillian Marie
Adkins, Kenneth Brian

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Operational and Mission Highlights

A MONTHLY SUMMARY OF TOP ACHIEVEMENTS

November 2020

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Essential Component Assembly Job Delivered Ahead of Schedule

On October 9, 2020 — five days ahead of the required delivery date — the Prototype Fabrication Division (in collaboration with Global Security, Sigma, and Pit Technologies divisions) signed off, packaged, and released 80 assemblies for a high-priority Global Security fabrication and assembly mission.

Having achieved clear expectations, customer engagement and exceptional team efforts across four Laboratory organizations, the collaborators fabricated, assembled, dimensionally inspected, and packaged 30 small cups, 35 medium cups and 15 large cups in just three weeks. In total, approximately 2,605 parts were required to make up the 80 required assemblies.

Laboratory Authors Report Summarizing U.S. Historical Experience with Nuclear Reactor Accidents and Safety Tests

This unclassified report provides a survey of reactor accidents, safety tests and criticality accidents spanning the nuclear test history of the U.S. Two key events described in the report are (1) the Kiwi-TNT reactor accident test, which was part of Rover space propulsion program; and (2) the SNAPTRAN-2 safety test of a reactor, which was intended to provide power to satellites and space probes. Such technology is of interest in assessing foreign nuclear weapons.

The Laboratory Takes a Step Towards Enabling Future Pit Production Efficiency and Agility by Reporting on Microstructure Characterization and Quasi-Static Strength Measurements for Initial Production Science Casting

The report includes the following:

- analytical chemistry results,
- details of microstructure evolution along the length of the cast aliquot rod, and

- qualitative elemental mapping that shows that the alloying element appears to sit in the Pu6Fe intermetallic.

The yield and flow strength of the material falls within the error bounds of the same data for current production material. These results indicate that specific alloying additions in material production streams do not substantially alter quasi-static strength. Further testing at higher strain rates is needed to expand this conclusion to dynamic conditions.

LANL and Lawrence Livermore National Laboratory Now Exchanging Debris Samples from Nuclear Tests for Inter-Lab Effort to Advance Radiochemical Analyses Capabilities

Laboratory samples were shipped to Lawrence Livermore National Laboratory (LLNL) in November. LLNL's samples should be delivered to the Laboratory in December. Both sample sets will be analyzed independently and select measurements will be compared.

LANL and Sandia National Laboratories used LANSCE "Blue Room" Irradiation to Provide Novel Diagnostic Testing

Using a capability that has not been exercised in more than a decade, an experimental team from LANL and Sandia National Laboratories characterized a flash neutron spectrometer and a current-mode gamma detector for future application on NDSE (Neutron-Diagnosed Subcritical Experiments) and HED (high-energy density) experiments.

Nightshade: A Subcritical Experiment Successfully Executed at the U1a Complex of the Nevada National Security Site

Nightshade A is the first of three subcritical experiments (SCEs) planned as part of the Red Sage–Nightshade series, each with six independent experimental devices all initiated almost simultaneously inside a single confinement vessel. The LANL/MSTS/Sandia National Laboratories/Lawrence Livermore National

Laboratory diagnostic and fielding team recorded multiple ejecta mass, velocimetry, and high-explosive and optical-ranging measurements on each of the plutonium samples. The team used dynamic Cygnus radiography and radiance measurements that were also acquired for a subset of the samples.

Full analysis of this large data set will take several months, but initial indications are that the diagnostic systems functioned as expected. These data, in conjunction with results obtained from the upcoming Nightshade B and C experiments, will provide important information to improve weapons physics models.

W88 Prototype Fabrication Passes Milestone Review

On November 12, 2020, the Prototype Fabrication Alt 940 Team successfully passed the NNSA Product Definition and Documentation Review (PDDR) without conditions. “Without conditions” reflects a significant achievement. Feedback from the PDDR committee included praise for standing up new facilities, processes, and infrastructure to support production activities, including the Mark Quality Manufacturing Center and a new paperless infrastructure to support production.

One of the critical gate reviews in the NNSA 6.X Production Realization Process, the PDDR must be passed for a program to move out of the Development phase and into the Process Prove-in phase before production readiness can be achieved. The PDDR ensures that requirements necessary for production are in place and mapped from design to production. The Prototype Fabrication team provides weapons systems

Weapons Program “Allocation 0” Budget Complete for FY21

Earlier this year, NNSA released site-specific funding, called “site splits,” immediately following the President’s Budget Release for the following fiscal year. As a result, the Laboratory’s Deputy Director of Weapons and the Weapon’s Finance group worked with NNSA to further break down those splits for the Laboratory’s Weapons Program. Part of this work consisted of defining work-package targets for project scope, schedule, and resources.

The recently completed result of this process — called “Allocation 0” — further details the Laboratory’s Weapons Program budget by each project, task, and organi-

zation in FY21 (expected to be a \$2.2-billion program, with an additional \$500,000 for construction).

SCIENCE, TECHNOLOGY, AND ENGINEERING

Battelle Highlights Fiber-Optic Seismic Sensing Experiment with EES

On October 27, 2020, the *Inside Battelle* blog featured Earth and Environmental Sciences (EES) Division research that leverages the Laboratory’s seismic expertise.

EES staff members Charlotte Rowe, Neill Symons, Jeremy Webster, and Christine Gammans collaborated with Battelle’s National Ecological Observatory network (NEON) team to explore the application of Distributed Acoustic Sensing (DAS) technology to detect seismic signals observed using a fiber-optic cable at a Colorado field site. A 30-year continental-scale ecology program, [NEON](#) is funded by the National Science Foundation and managed by Battelle.

DAF uses pattern changes in laser pulse returns that have scattered off irregularities along a fiber-optic cable. Scientists use these patterns to assess linear strains of the cable; these strains provide information about ground variations. DAS can use existing cables (such as telecommunications cables) to identify seismic signals that reveal disturbances, such as human or wildlife activity, as well as earthquakes or longer-term strains, such as hydrologic cycles. Read the Battelle blog [here](#).

Bette Korber Gives NMRS Virtual Conference Keynote

On November 9, 2020, Laboratory Fellow Bette Korber of Theoretical Biology and Biophysics (T-6) gave the keynote address at the New Mexico Academy of Sciences and EPSCoR Virtual Conference. The title of Korber’s talk was “Our Immune System, Vaccines, and Vaccine Strategies for AIDS and COVID-19.”

In the talk, Korber described ongoing work at the Laboratory that is contributing to global vaccine efforts for HIV-1 and COVID-19. She said the rapid evolution and extraordinary diversity of HIV produce particular challenges to develop an AIDS vaccine, and that her team’s work focuses on strategies to contend with that diversity.

By contrast, SARS-CoV-2, the virus that causes COVID-19, has evolved very slowly during the pandemic, although even this limited diversity can be important. Kober and her team are tracking emerging viral diversity to help design appropriate reagents to ensure that COVID-19 vaccines and therapeutics currently under development will remain relevant over the coming year. Using those tracking tools, last April 2020, Korber said she and her team identified a SARS-CoV-2 variant that appeared to be more transmissible than the original form. This viral variant was subsequently shown to be more infectious experimentally, and it has now become the globally dominant form of the virus.

BOTTLE Consortium Launched and New Paper Published in *Metabolic Engineering*

Scientists from the Laboratory's Bioscience Division have joined a new DOE consortium known as BOTTLE (Bio-Optimized Technologies to keep Thermoplastics out of Landfills and the Environment). The Laboratory scientists will apply Smart Microbial Cell Technology, which in 2020 earned an R&D 100 Award and a Special Recognition Award for Mark Disruptor in Services, to focus on two critical aspects of tackling the plastic pollution problem. As described in a recent Laboratory news release, LANL will develop novel ways to degrade and upcycle today's plastic-based wastes and also redesign tomorrow's plastics to be recyclable-by-design.

Local media highlighted the Laboratory's participation in the BOTTLE consortium, with Taraka Dale featured on KOB TV, Taos News, and KSFR radio. In addition, the Laboratory team recently published a seminal paper in *Metabolic Engineering*. This paper presented the work by the team in collaboration with the University of Georgia-Athens and the National Renewable Energy Laboratory.

In this paper, the authors explain how to make terephthalic acid (TPA) from renewable carbon sources. The paper also discusses how to develop a TPA-detecting biosensor and presents the discovery of a key membrane protein that can transport TPA into a microbial cell. A degradation product of the common plastic polyethylene terephthalate (PET), TPA is thus a relevant molecule for recycling or upcycling. Transporting and detecting TPA is key to improving biocatalysts for the degradation of PET into TPA, which will be an important area of focus for the Laboratory working within the BOTTLE consortium. The work for this paper was conducted under a Collaborative Research and Development

Agreement (CRADA) supported by a Directed Funding Opportunity from DOE's Agile BioFoundry.

Reference: Isabel Pardo, Ramesh K. Jha, Ryan E. Bermel, Felicia Bratti, Molly Gaddis, Emily McIntyre, William Michener, Ellen L. Neidle, Taraka Dale, Gregg T. Beckham, and Christopher W. Johnson. Gene amplification, laboratory evolution, and biosensor screening reveal Muck as a terephthalic acid transporter in *Acinetobacter baylyi* ADP1. *Metabolic Engineering* **62** (2020) 260-274. <https://doi.org/10.1016/j.ymben.2020.09.009>.

EES Neural Network Locates, Quantifies Natural Gas Leaks

In an article published on November 23, 2020, *Forbes* [highlighted](#) a new technology that could reduce methane missions by up to 90 percent. Led by the Earth and Environmental Sciences Division, Manvendra Dubey, Bryan Travis, and Jeremy Sauer developed machine-learning codes that analyze the speed and direction of wind currents to trace methane leaks back to their sources. Currently, available technologies used to detect methane leaks are too expensive to use frequently. However, the Autonomous, Low-cost, Fast Leak Detection System (ALFaLDS) — a recipient of a 2019 R&D 100 Award — detects such leaks quickly and inexpensively. Algorithms are used to analyze the data that come off almost any gas or wind sensor, including — potentially — sensors attached to cars or drones. The team is working with industrial partners to commercialize the technology with the hope that this software — a type of machine-learning code known as a “neural net” — will be adopted widely by the energy industry.

Fission-Product Diagnostics for Post-Detonation Nuclear Forensics

Sensitive to both fuel type and neutron energy, fission-product distributions provide useful diagnostics for post-detonation nuclear forensics. A recent set of inter-laboratory experiments with Pacific Northwest National Laboratory (PNNL) involved measuring fission-product ratios and yields in irradiations of highly enriched uranium and depleted uranium (DU) in a 14-MeV neutron spectrum. Large targets of both materials, irradiated at PNNL, were analyzed for a suite of fission products and short-lived actinides using separated element radiochemistry. A team of scientists from the Laboratory's Nuclear and Radiochemistry group completed measurements for ^{89}Sr , ^{91}Y , ^{95}Zr , ^{97}Zr ,

⁹⁹Mo, ¹¹¹Ag, ¹¹⁵,^{115m}Cd, ¹³⁶Cs, ¹³⁷Cs, ¹⁴⁰Ba, ¹⁴¹,¹⁴³,¹⁴⁴Ce, ¹⁴⁷Nd, ¹⁵³Sm, ¹⁵⁶Eu, ¹⁶¹Tb, ²³⁷U, and ²³⁹Np.

Good agreement was observed (1) between the two analytical laboratories, and (2) with the theoretical values for cumulative fission product chain yields in the high-energy spectrum. These experiments are significant because the high-energy neutron (14 MeV) spectrum induces a significantly different fission product distribution than the thermal spectrum typically evident in nuclear reactors. This different distribution is reflected by elevated yields for valley and wing isotopes, such as ¹¹¹Ag, ¹¹⁵Cd, and ¹⁶¹Tb. For DU, the higher energy spectrum could also be probed by an increase in ²³⁷U vs ²³⁹Np production, with excellent actinide analysis agreement between laboratories.

Laboratory personnel historically performed similar calibration experiments in the 14-MeV endpoint region at the Cockcroft-Walton accelerator facility, but such experiments have not been conducted for decades. This work was funded by the NNSA Office of Defense Nuclear Nonproliferation Research and Development. Future plans include expanding the suite of target fuels to plutonium and developing a tailored neutron energy capability at Los Alamos Neutron Science Center.

Research team: Mitzi Boswell, Don E. Dry, Mateusz Dembowski, Andrew J. Gaunt, Susan K. Hanson, Lisa A. Hudston, Mike R. James, William S. Kinman, Gabrielle Lee, Cheriece Margiotta, Iain May, Daniel Meininger, Jeffrey L. Miller, Sean Reilly, Randy J. Rendon, Jennifer R. Romero, Nathan C. Smythe, Jennifer M. White, Josh M. Williams, and Melinda S. Wren.

Point of Contact: Susan Hanson, team lead from C-NR.

Harshini Mukundan of Chemistry Division on the Cover of Jade Magazine

Laboratory deputy group leader, team leader, and staff scientist Harshini Mukundan was recently featured on the cover of JADE Magazine, an online platform for Asian women. Mukundan was [profiled](#) for her research on developing rapid diagnostics for a number of diseases, including sepsis, tuberculosis and COVID-19. Mukundan is also well known for her mentoring and was named as an [AAAS IF/THEN®](#) ambassador in 2019. IF/THEN's mission is to advance women in STEM fields "by empowering current innovators and inspiring the next generation of pioneers." In the interview,

Mukundan shared her experiences as an Asian woman scientist.

HPC's Supercomputer Chicoma Helping to Fight COVID-19

High Performance Computing Division (HPC) has a new supercomputer called Chicoma to help fight COVID-19. Along with other Laboratory scientists, Karissa Sanbonmatsu, a scientist in Theoretical Biology and Physics (T-6), is using the supercomputer to help design drugs that will work as therapeutics for COVID-19. Sanbonmatsu mentioned that other efforts at the Lab include looking at how the disease spreads throughout the population and through the country in an effort to review strategies to stop the spread.

Chicoma will help scientists to create large-scale molecular simulations of the virus and will also look at how the COVID-19 virus could affect human chromosomes. According to Sanbonmatsu, there is evidence that other viruses do detrimentally affect the shape of human chromosomes, which can in the long run detrimentally affect how the human body responds. Sanbonmatsu and her team are wondering if that could also be true for COVID.

A [story](#) on this research aired on KOB-TV 4 on November 6, 2020.

Lab Publishes "Fitness-for-Service Strategies for Impulsively Loaded Vessels" in the *Journal of Pressure Vessel Technology*

The manuscript reports on an investigation of a representative explosive containment vessel using actual flaw data for both embedded weld flaws and fragment damage. The paper presents a procedure for conservatively eliminating concern regarding the detrimental impact on vessel performance of the vast majority of the flaws detected by modern nondestructive inspection methods.

Laboratory Centrifuge Facility Produces Radiograph of Article under High-G-Loading

The Laboratory's Centrifuge Test Facility has added radiographic imaging to its list of capabilities. This facility has been an invaluable asset to the testing capabilities

of the U.S. nuclear weapons complex, particularly for its use to evaluate components and qualify full weapon systems by simulating the extreme condition of atmospheric reentry.

Over the past two years, the radiography capability has been under development to expand the value and versatility of the centrifuge. As of October 2020, radiography has become a functional part of the facility, after final development work was completed to support the SRP (Stockpile Responsiveness Program). The first radiographic imaging of a newly designed primary system (mock) under high-g-loading was completed on October 22, 2020. This type of imaging will allow an alternate means of analysis to complement the internal strain-gauge measurements.

Los Alamos Staff Continue Experiments Remotely at DCS

An NNSA capability operated by Washington State University, the Dynamic Compression Sector (DCS) couples dynamic loading platforms to a dedicated x-ray beam line at the Advanced Photon Source (APS at Argonne). Current capabilities include two single-stage and one two-stage gun systems with impact velocities ranging from 0.3 to 5.5 km/s (12.5-mm bore), and a 100-joule laser-drive system capable of providing shock loading with time durations on the order of 5–10 ns.

The DCS paused operations, along with the APS, as stay-at-home orders went into effect back in March 2020. In July 2020, with a minimum number of DCS staff onsite, the concept of remote operations was tested by the DCS using the C-hutch for laser-drive experiments. The first series of remote experiments was largely successful, so DCS began working towards remote operations for all hutches, including plate-impact experiments in August and September, 2020.

The Laboratory's DCS Collaborative Access Team submitted five experiment requests for experiments at the DCS for the Fall 2020 Run Cycle 3. These experiments included x-ray diffraction measurements in October 2020 on the shock melting of Sn, phase transitions in magnesium fluoride, and polymers.

To facilitate these experimental requests during remote operations, the Laboratory (1) purchased all components required to build DCS experiments in Los Alamos, and (2) set up an assembly area at the DEOS (Dynamic Equations-of-State) facility.

Recent Advances in Americium Isotopic and Assay Measurement

Scientists in the Laboratory's Actinide Analytical Chemistry (C-AAC) group recently published an article that describes preparing $^{241}\text{Am}/^{243}\text{Am}$ gravimetric mixtures and developing americium isotopic and assay measurement techniques that use thermal ionization mass spectrometry.

The Laboratory is collaborating with the DOE Office of Science to produce americium oxide ($^{241}\text{AmO}_2$) to recover the ^{241}Am (b-decay of ^{241}Pu , which produces ^{241}Am) from high-dose plutonium materials held in LANL inventory. The production effort has the benefit of reducing external radiation exposures while providing a domestic source of $^{241}\text{AmO}_2$ for sale to industrial manufacturers of well-logging sources and smoke detectors. To certify $^{241}\text{AmO}_2$ product material, C-AAC personnel developed analytical methods to characterize attributes in the $^{241}\text{AmO}_2$ production specification. Analytical methods support the need for americium isotopic and assay measurements.

Reference: Mathew K. J., Ottenfeld C. F., Keller R. C., Kuhn K. J., and Fulwyler J. B. (2020) Preparation of $^{241}\text{Am}/^{243}\text{Am}$ gravimetric mixtures and development of Am isotopic and assay measurement techniques using thermal ionization mass spectrometry, *International Journal of Mass Spectrometry*, <https://doi.org/10.1016/j.ijms.2020.116430> (LA-UR-23098).

RETRO Rx Featured in an R&D World Magazine Podcast

A new [podcast](#) produced by *R&D World* magazine featured Alina Deshpande, Biosecurity and Public Health group leader, alongside Geoffrey Fairchild of Information Systems and Modeling. The podcast dove into the science of past R&D 100 Award winners by interviewing the scientists behind the award-winning technology RETRO Rx.

Made up of the tools AIDO and RED Alert, RETRO Rx uses easy-to-use web interfaces and visual analytics to help decision makers respond to infectious disease outbreaks and re-emergence events. During the podcast, Deshpande and Fairchild discussed tool development and applications. One application for AIDO is taking data from historical outbreaks to help decision makers understand and contextualize current or future situations. Early during the COVID-19 pandemic, the developers used AIDO to draw parallels between the

first outbreak in China and outbreaks that had previously occurred for MERS and SARS. The developers also identified hospital admissions for respiratory syndromes as a rapid means to estimate spread.

Deshpande and Fairchild also described how to use RED Alert to (1) detect the potential re-emergence of infectious diseases through a supervised machine-learning algorithm, and (2) help long-term planning for mitigation.

Studying EBW Detonators at High Temperatures

Exploding bridgewire (EBW) detonators initiate detonations in explosive materials. These detonators are similar to blasting caps in that they both use electric currents. However, EBW detonators are much more precise and have better safety characteristics.

Because EBW detonators have a variety of purposes — including use in nuclear weapons — they thus are subjected to a variety of conditions during transport and use. However, scientists have conducted few studies to ascertain EBW detonator stability at high temperatures. A Laboratory team of researchers has been working to remedy this knowledge gap, with its results featured on the cover of a recent issue of the journal *Propellants, Explosives, Pyrotechnics*.

Many EBW detonators contain pentaerythritol tetranitrate (PETN) as the initiating explosive. PETN has been shown to melt at a relatively low temperature of 141°C, followed by an onset of decomposition of the explosive at approximately 160°C. In the work described, the team evaluated PETN behavior by using x-ray radiography on commercial EBW detonators exposed to temperatures just above the melting point. These experiments revealed that PETN remains stable in the solid-state. However, after reaching melting temperatures, PETN is vulnerable to mixing, followed by a rapid evolution that leads to gases and decomposition.

These results indicate that the orientation of the thermally treated detonator with respect to gravity plays an important role once PETN reaches a melted state — this means that heated EBWs perform differently depending on their orientation. The results help to explain for the first time why thermal tests on PETN-based detonators often result in varied outcomes.

Reference: Virginia W. Manner, John D. Yeager, Laura Smilowitz, Dennis Remelius, and Bryan F. Henson, "Function of a PETN-Based Exploding Bridgewire Det-

onator Post Melt," *Propellants, Explosives, Pyrotechnics*, V. 45 Issue 10. <https://doi.org/10.1002/prep.202000077>. Released under LA-UR 20-22596.

Two New Papers Published from the Carbon Cycling Science Focus Area team

As part of the Terrestrial Microbial Carbon Cycling Science Focus Area, Bioscience Division scientists used microcosms to study how plant litter decomposition varies among 206 soil communities.

Two recent papers describe the team's analysis of the microbial communities using multiple techniques, such as measuring species diversity, gene expression, and machine learning. Overall, the team concluded that the interactions among the organisms in the soil are critical for determining how the entire community cycles carbon. This finding caused a dramatic shift in the focus of future research — to manipulate community function, research must focus on the microbial interactions rather than the physiology and functions of specific organisms. Overall, the findings could help improve carbon-cycling models and even elucidate ways for scientists to adapt microbiomes to increase carbon storage to improve soil health, agriculture, sustainable biofuels production and other applications. The research was published in these two papers and was featured in a DOE blog post in August 2020.

Reference 1: Albright MBN, Johansen R, Thompson J, Lopez D, Gallegos-Graves LV, Kroeger ME, Runde A, Mueller RC, Washburne A, Munsky B, Yoshida T and Dunbar J (2020) Soil Bacterial and Fungal Richness Forecast Patterns of Early Pine Litter Decomposition. *Front. Microbiol.* [11:542220](https://doi.org/10.3389/fmicb.2020.542220). doi: [10.3389/fmicb.2020.542220](https://doi.org/10.3389/fmicb.2020.542220)

Reference 2: Michaeline B N Albright, Jaron Thompson, Marie E Kroeger, Renee Johansen, Danielle E M Ulrich, La Verne Gallegos-Graves, Brian Munsky, John Dunbar, Differences in substrate use linked to divergent carbon flow during litter decomposition, *FEMS Microbiology Ecology*, Volume 96, Issue 8, August 2020, fiae135, <https://doi.org/10.1093/femsec/fiae135> <https://www.energy.gov/science/ber/articles/traits-microbes-matter-microbial-carbon-cycling-and-storage>

ASM Improves Requisition Process Management and Responsiveness

The Laboratory's Acquisition Services Management (ASM) Division conducted an in-depth analysis of the current process of going from purchase request (PR) to purchase order. Personnel conducted this analysis to understand and mitigate bottlenecks and pain points while working toward subcontract awards and minimizing the sizable PR backlog.

Analyzing the causes of the underlying backlog enabled ASM (1) to develop a more proactive approach to PR management, and (2) to take a more proactive approach in overcoming obstacles. ASM is now applying a newly developed Acquisition Milestone Schedule for longer term and complex procurements. Furthermore, procurement specialists are reminded to communicate urgently with a partner or stakeholder, if required critical information experiences delays during the acquisition process. In addition, procurement specialists are being trained to use or create more-efficient buying channels while in parallel managing multiple PRs.

ASM Receives Approval of \$95 Million Task Order for Triad-Named Small Business Subcontractor

The Laboratory's Acquisition Services Management (ASM) Division received consent from NNSA on a new task order worth \$95 million for Longenecker & Associates, a small business subcontractor for Triad National Security, LLC. This new task order will enable the Laboratory to continue to use the company's expertise in support of various programs, such as Radiological Control Technicians, Capital Projects, Material Control and Accountability, and Waste Management.

Crystal Lab Renovation Wraps Up: High-Explosives R&D Will Enjoy an Updated Facility

The renovation of the 4,000-square-foot concrete structure is scheduled to wrap up this fall. The revamped facility will provide nearly three times as much space as the existing facility, with advanced HVAC systems to provide heating and cooling to within 1-degree Fahrenheit, thus ensuring extremely tight tolerances can be achieved in programmatic operations.

The consolidated operations in the one purpose-built facility will greatly accelerate work flows of high-explosives science and technology development. The project, one of the high-level deliverables for the NA-50 "Make it Happen" List, was conducted without a single safety incident.

DARHT Weather Enclosure Officially Brought to Completion

The NNSA's Los Alamos Field Office approved the Safety Assessment Document and the Accelerator Safety Envelope, with an Implementation Verification Review now underway. The Dual-Axis Radiographic Hydrodynamic Test Facility's downstream transport has been installed and the image-collection systems are in the process of installation. The first hydrodynamic experiment is planned for early CY2021.

Kudos to Facilities & Operations Point of Contact with Environmental Management System

In October 2020, Michael Hazen of the Associate Laboratory Directorate for Environment, Safety, Health, Quality and Safeguards and Security recognized Erick Rodriguez Gonzalez for his strong contributions in managing the Laboratory's environmental responsibilities.

Hazen recognized the work of Rodriguez Gonzalez for his role in maintaining the Laboratory's DOE-required site-wide ISO 14001:2015 recertification. A Packaging Engineer in the Readiness Packaging and Transportation-Packaging and Transportation (RPT-PT) organization, Rodriguez Gonzalez is the Facilities & Operations point of contact for the Environmental Management System and provides a "valuable link between programs and environmental professionals," according to the letter sent by Hazen.

Laboratory Benefits Hosts First-Ever Virtual Benefits Expo

More than 3,900 employees visited the Laboratory's first-ever Virtual Benefits Expo, a collaborative online adaptation established to accommodate a workforce largely working from home. In 2019, the expo's onsite participation rate consisted of approximately 1,800 employees.

This year's Virtual Benefits Expo counted how many employees visited each vendor booth and participated in events, such as drawings and surveys. These data are used to gauge employee interests in each vendor; such data were previously unquantified with an onsite expo.

Employee survey feedback revealed that the virtual online expo yielded greater access. Several employees noted they never had the time to visit this expo in person and that the new format allowed them to attend and participate this year. Employee feedback also included praise for the expo's ease of navigation, fun, and clever design. Laboratory Benefits collaborated with the communications and web design teams within the Communication Arts and Services group to create an innovative and interactive avatar-theme expo site, in addition to promoting each day's events.

Laboratory's IACUC Continues Full-Accreditation Status

The Laboratory's Institutional Animal Care and Use Committee (IACUC) received continued full-accreditation status from the American Association for Accreditation of Laboratory Animal Care (AAALAC). AAALAC commended the IACUC for providing and maintaining an exemplary program of animal care and use. Especially noteworthy items were the following:

- exceptional Integrated Work Documents that served as an excellent protocol augmentation management tool to assess workplace hazards;
- the comprehensive Animal-Related Incident Report, which encouraged effective IACUC discussion of corrective actions and preventive measures;
- the all-inclusive occupational health and safety program, which effectively safeguarded field research personnel and had an impressive 100 percent participation rate;
- the detailed and forward-thinking protocol form, which was user-friendly and covered all aspects of an effective animal care and use program; and
- the well-coordinated post-approval monitoring program, which included excellent veterinary involvement and oversight.

The Laboratory's Animal Care and Use Program has been accredited since 1967 by AAALAC.

Material Inventory and Heat-Source Testing Completed Successfully

Laboratory personnel made significant process in preparing and executing material control and accountability inventory for Actinide Materials Power & Processing (AMPP) groups at the Plutonium Facility. Because of the nature of material processed and the size of the areas where materials are measured, personnel must take a high number of measurements. Personnel spent long hours cleaning and prepping boxes to ensure quick entry and exit of inventory, a process that supports the safety and security of TA-55.

As part of production quality control, AMPP-1 destructively tests every fiftieth War Reserve heat-source final assembly (HSFA) that they build. Over the last several weeks, AMPP-1 completed the second destructive test and analysis (metallography, etc.) of a production HSFA. This work was completed significantly ahead of schedule.

National Security Research Center Produces Two Laboratory History Documentaries

The documentaries are "[The Science of Trinity](#)" and "[Trinity and the British Mission](#)," both of which focus on the Laboratory's first charge: to build the world's first atomic weapons to help end World War II.

"The Science of Trinity," the story of LANL's development of the world's first nuclear weapon in 1945, was a joint project with the Laboratory's Science, Technology and Engineering Directorate and led by Deputy Laboratory Director John Sarrao. The content of both documentaries was largely created by the National Security Research Center, which is the Laboratory's classified library and also houses unclassified collections and artifacts that date back to the Manhattan Project era. Both documentaries were filmed and edited by XIT media specialists David Tietmeyer and Howard Coe.

Nuclear Enterprise Saving Tens of Thousands, Thanks to the Laboratory's New Lathe

Teams in Prototype Fabrication (PF) have acquired a new machine that is helping the Laboratory and its customers save significant time and money. The teams

have replaced a decades-old lathe with a new Okuma computer-numerical-control lathe. This new lathe supports the production of nonnuclear weapons components for the nuclear enterprise. Significant research went into selecting this machine, so that it can work in a classified environment. For example, this lathe has certain programming specifications and can be maintained and repaired without the support of outside vendors.

Since acquiring the Okuma in 2019, PF machinists have spent on average 80 hours manufacturing a single component, compared to more than 150 hours spent on the previous machine. This reduction in time means not only have employees increased efficiency by more than 200 percent, but also both the Laboratory and customers at sites such as Sandia National Laboratories and Pantex are saving a lot of money. Compared to the previous machine, in FY20 projects completed on the Okuma have saved customers \$21,000 per component.

Operations Programs Assists in Expediting Shipments to Support the Laboratory's Mission

Operations Programs' receiving and distribution teams, which are part of the Associate Laboratory Directorate for Facilities and Operations, assisted in expediting two shipments in support the Laboratory's pit production mission. The first shipment of maintenance-related materials and the second shipment of Personal Protective Equipment were expedited to facilitate critical items needed at TA-55.

The receiving team leader acknowledged a request to expedite the process. Upon receipt of the request, several group leaders at TA-55 agreed to release the materials for expedited delivery. When all approvals were met, distribution members retrieved the items from Quality Assurance and delivered them to the receiving team to process out. The customer was notified that the shipments were ready. Both requests were completed in less than two hours.

Procurement and Supply-Chain Support Makes Way for Pandemic Precautions and Mission Success

Within the Operational Readiness Implementation Division of the Associate Laboratory Directorate for Weapons Production there is a group, Supply Chain

Management (ORI-3), that provides supply-chain management services, including procurement, warehousing and production support — all critical areas that support the plutonium mission. In FY20, ORI-3 experienced a 30-percent increase in processing procurement requests than in 2019 and 47 percent more than in 2018. Group members ordered material in support of 88 different capital/maintenance projects and seven facilities, in addition to supporting procurement efforts to support COVID-19 precautions, such as masks, hand sanitizer, and personal protection equipment. ORI-3 designed and implemented a COVID-19 daily task submission tool and an asset request system that supports employees working from home and maintains requests for supplies onsite. With input from customers in the Plutonium Facility, ORI-3 submitted a \$6.7 million SAVY Nuclear Container order, which will support the processing of hazardous materials, storage and shipping. Overall, ORI-3's work in FY20 provided a new level of support to the national security mission.

UI Assists with Laboratory's drive-Thru Flu-Shot Clinic

This year's flu-shot clinic looked different from past years. This year, the Laboratory's Occupational Safety and Health Division worked with Utilities and Institutional Facilities to provide a drive-thru clinic for flu vaccines to minimize the potential risk of exposure to COVID-19. The drive-thru clinic provided about 4,000 vaccines to employees.

COMMUNITY RELATIONS

Laboratory Commemorates Rudolfo Anaya "I Love To Read Day"

To mark New Mexico's Rudolfo Anaya "I Love To Read Day" on October 30, 2020 (the late author's birthday), the Laboratory hosted a recorded reading of his book, *No More Bullies*, by Laboratory employee Mary Beth Lujan. The recording was played for third-grade students in Española, Taos, and Santa Fe schools. Laboratory operator Triad provided two copies of the book to each of the 21 classrooms that took part in this event.

Laboratory Donates Key Equipment to Support Future Employees

The Laboratory's Detonator Production Division recently donated a Bridgeport Milling Machine to UNM-Los Alamos (UNM-LA). The mill was delivered to UNM-LA on October 29, 2020.

UNM-LA offers certificate and associate degree programs in various applied technologies, such as Electro-Mechanical Technology, Welding, and Robotics. These programs provide skilled workers to employers in the northern New Mexico area. The university's dedicated fabrication space enables students to engage in hands-on training in skills such as fabrication and machining techniques.

Valued at \$10,000, the mill will enhance UNM-LA's existing equipment by offering training on more modern equipment than a future worker might encounter on the job, thereby increasing their skills and qualifications. Community partnership and collaboration are central to the Laboratory's mission, and this accomplishment will support employee development and continuing education for future Laboratory employees.

Laboratory Organizes Online Science Festival for Students from Picuris Pueblo

As part of the STEM and River Festival that took place on November 9 and 10, 2020, the Laboratory and its nonprofit partner Ogallala Commons helped more than 25 students from Picuris Pueblo take part in two afternoons of virtual education. Students from grades 5 through 12 took part in interactive sessions that covered everything from amphibians and beavers to black holes. The DOE Office of Nuclear Energy provided some microscopes that work with smartphones or tablets. Teaching the students how to operate these microscopes was Melinda Higgins, DOE's nuclear energy Tribal STEM advisor.

Welcoming the students on the first day, Nan Sauer, senior director of the Partnerships and Pipeline Office at the Laboratory, encouraged them to consider a career in science, saying they could play a role in solving some of the problems facing the world. On the second afternoon, the Laboratory's student internships program director Cassandra Casperson gave an overview of the internship opportunities available at the Laboratory for high school and college students, as well as the pro-

grams at colleges in the region that lead to careers at the Laboratory.

NNSA Field Office Hosts Virtual Public Information Session on FTWC Venting

On November 5, 2020, NNSA's Los Alamos Field Office hosted its second virtual public information session to discuss the planned venting of four Flanged Tritium Waste Containers (FTWCs). This meeting followed a virtual meeting on October 20, 2020 in which technical difficulties severely impacted the quality of the meeting.

The Field Office held the meetings in response to a high level of interest from stakeholders regarding the FTWC venting project. Both meetings were advertised through local media and through the Laboratory's [Electronic Public Reading Room](#), the primary vehicle for notifying the public of the availability of regulatory documents associated with the Resource Conservation and Recovery Act.

For the October 2020 meeting, 84 members of the public called or logged into the meeting. For the November 5, 2020 meeting:

- The Laboratory switched to the WebEx Events platform to implement more controls over the audio and video, thus removing many of the issues that hampered the October meeting.
- 128 members of the public called or logged in for a presentation and to hear Q&As that came from the first meeting.
- Attendees had the benefit of reference material posted to a [FTWCs webpage](#) created following the October meeting.
 - FTWCs webpage has Q&As, a factsheet, copies of the presentation and meeting access information/instructions.
 - The Laboratory will continue to post Q&As to the FTWCs webpage as they are developed, reviewed, and approved.

SELECTED MEDIA COVERAGE

[New Mentor-Protégé Program between Triad and Pueblo Alliance, LLC Grooms Native Businesses for Successful Contracting](#)

Los Alamos Reporter (10/28)

A new mentor-protégé program between Triad National Security and Pueblo Alliance, LLC will groom Pueblo businesses for success in landing contracts with Los Alamos National Laboratory and other U.S. Department of Energy entities. Mentorship areas include business planning, business development, marketing, proposal development, and quality assurance.

[Study Reveals Robust Performance in aged Detonator Explosive](#)

Phys.Org (10/29)

In a large, statistically significant, one-of-a-kind study, researchers at Los Alamos National Laboratory have confirmed that the explosive called PETN (Pentaerythritol tetranitrate), stabilized with a polysaccharide coating, is resistant to changes in particle shape, size, and structure that can degrade detonator performance over time.

[Breakthrough Quantum-Dot Transistors Create a Flexible Alternative to Conventional Electronics](#)

ScienceDaily (10/30)

Researchers at Los Alamos National Laboratory and their collaborators from the University of California, Irvine have created fundamental electronic building blocks out of tiny structures known as quantum dots and used them to assemble functional logic circuits.

[Science Can Help Ease Local Wildfire Threats](#)

Santa Fe New Mexican—Michael Hazen (10/31)

As drought and wildfires continue to devastate forests in Northern New Mexico and across the Western United States, it's natural to wonder if we're doing enough to keep our communities and lands safe. Smoky summer skies over Los Alamos and other surrounding communities provide yet another reminder that danger is just a spark away. With that in mind, Los Alamos National Laboratory is taking measures to prevent wildfires and the dangers they present by carrying out unique firefighting strategies across its 42 remote square miles.

[Breakthrough Quantum-Dot Transistors Open the Door to a Host of Innovative Electronics](#)

SciTech Daily (11/2)

Researchers at Los Alamos National Laboratory and their collaborators from the University of California, Irvine have created fundamental electronic building blocks out of tiny structures known as quantum dots

and used them to assemble functional logic circuits. The innovation promises a cheaper and manufacturing-friendly approach to complex electronic devices that can be fabricated in a chemistry laboratory via simple, solution-based techniques, and offer long-sought components for a host of innovative devices.

[Los Alamos Scientists Find a Way to Quickly Test Rust on Graphene-Protected Cars, Planes, Ships](#)

AZO Materials (11/2)

Trace amounts of graphene could create a decades-long protective barrier against oxygen corrosion for cars, aircrafts, and ships—but evaluating its effectiveness has been a challenge, until now. Los Alamos National Laboratory scientists report a possible solution in the latest issue of The Journal of Physical Chemistry Letters.

[New Los Alamos Spin-Off Aims to Put Nuclear Reactors in Space](#)

Mirage News (11/2)

A new agreement hopes to speed along a nuclear reactor technology that could be used to fuel deep-space exploration and possibly power human habitats on the Moon or Mars. Los Alamos National Laboratory has signed an agreement to license the “Kilopower” space reactor technology to Space Nuclear Power Corporation (SpaceNukes), also based in Los Alamos, NM.

[Advent Technologies to Collaborate with Los Alamos, UT Austin, RPI, UNM and Toyota in the Development of Next-Generation HT-PEM Fuel Cell Technology](#)

Green Car Congress (11/3)

Hydrogen and fuel cell technology company Advent Technologies will collaborate with Los Alamos National Labs, University of Texas at Austin (UT Austin), Rensselaer Polytechnic Institute (RPI), University of New Mexico and Toyota Motor North America R&D (TMNA R&D) to continue development of next-generation high-temperature polymer electrolyte membrane (HT-PEM) fuel cell technology for the automotive industry.

[How Do Geiger Counters Work?](#)

Howstuffworks (11/4)

“GMs [Geiger-Muller counters] are used elsewhere, especially when a low cost solution that doesn't require distinguishing radiation type or energy is desired,” the Los Alamos National Laboratory (LANL) explains in an email.

[Los Alamos Spin-Off to Commercialize Space Reactors](#)

World Nuclear News (11/4)

Los Alamos National Laboratory (LANL) has agreed to license Kilopower space reactor technology to New Mexico company Space Nuclear Power Corporation (SpaceNukes), which aims to commercialize the technology for use in space in the next few years.

[Los Alamos Celebrates Five-Year Anniversary of Manhattan Project National Historical Park with Virtual Events](#)

Los Alamos Daily Post (11/5)

Los Alamos — where discoveries are made — will be hosting a series of virtual events to commemorate the fifth anniversary of the Manhattan Project National Historical Park (MAPR).

[Los Alamos National Lab ‘Supercomputer’ Used to Study Impacts of COVID-19](#)

KRQE-TV—Gabrielle Burkhart (11/5)

As the COVID-19 virus makes its way through communities, scientists at Los Alamos National Laboratory are spearheading the fight against it with innovative research and development.

[Los Alamos National Lab Uses New Supercomputer to Study COVID-19](#)

KOB-TV (11/6)

Los Alamos National Laboratory has a new High-Performance Computer (HPC) called Chicoma to help fight COVID-19. Karissa Sanbonmatsu, a scientist with LANL, is using the supercomputer along with other scientists.

[Fallen Trees become Firewood for Local Pueblos: Mitigation Project Provides Wood for Kiva Fireplaces and Woodstoves](#)

Los Alamos Reporter (11/9)

“Recent events have made it more challenging for New Mexicans to gather firewood,” said Laboratory Director Thom Mason. “The Laboratory is grateful that our Pueblo partners can put the wood to good use again this year.”

[LANL Launches Educational Website to Help Students, Teachers and Parents](#)

KOB TV—Brett Luna (11/9)

Los Alamos National Laboratory (LANL) launched a new website that provides resources for students who are learning from home.

[Los Alamos National Labs Participates in New Initiative to Help Reduce Plastic Pollution](#)

KOB TV—Brett Luna (11/9)

We’ve all seen images of plastic bottles piling up where they shouldn’t be. Now, Los Alamos National Laboratory is trying to be part of the solution. “Nobody wants to stop using plastics. They’re lightweight and they’re easy to use. There is a reason why these types of polymers are in everything we use, but we have to find a way to do this better,” said Taraka Dale, LANL lead for the BOTTLE program.

[NMSU, Los Alamos National Laboratory to Collaborate on Joint Appointments](#)

KRWG (11/9)

New Mexico State University and Los Alamos National Laboratory have signed a new institutional agreement to support joint appointments. The joint appointments will provide opportunities for NMSU and LANL to attract, retain and recognize science and engineering staff and faculty with the goal of enhancing the quality of science, technology, education and industrial development in the region, state and nation.

[RR Company Nears Creation of Masks That Kill COVID](#)

Albuquerque Journal (11/13)

A Rio Rancho small business is developing an anti-viral mask, the formula has undergone testing at UNM and at Los Alamos National Laboratory. Testing at Los Alamos lab indicates the treatment was also anti-bacterial.

[Lightning ‘Superbolts’ Can Be 1,000 Times Brighter than Ordinary Flashes, Study Finds](#)

Washington Post (11/14)

The study was led by Michael Peterson, a scientist at Los Alamos National Laboratory in Los Alamos, N.M. His team examined two years’ worth of data from the GOES weather satellites, which peer down on North and South America with ultrahigh resolution.

[From New Mexico to Mars](#)

Albuquerque Journal (11/15)

Perseverance includes sophisticated laser, sensing and detection devices built by Los Alamos National Laboratory in collaboration with international partners to conduct the critical geologic and mineral analysis that could determine if life ever existed on Mars.

[Will the Coronavirus Evolve to be Less Deadly?](#)

Smithsonian Magazine (11/16)

A team led by Bette Korber, a computational biologist at Los Alamos National Laboratory, published a paper in the journal *Cell* in July showing that a strain carrying a mutation identified as D614G appeared to be replac-

ing the initial strain that first emerged out of Wuhan, China.

[Albuquerque Business First: NMSU and LANL Sign New Agreement](#)

Albuquerque Business First—Staff Report (11/17)

New Mexico State University and Los Alamos National Laboratory have signed an agreement for joint appointments. According to the article, the joint appointments “will provide opportunities for the two organizations to attract and retain science and engineering staff and faculty.

[Exploiting the “Legacy Tax” Loophole for HPC Storage](#)

The Next Platform—Nicole Hemsoth (11/18)

With computational storage in an FPGA, Los Alamos was able to do high performance scientific compression at rates that went from 6% to 30%, a pretty striking improvement.

[Deputy Director Kelly Beierschmitt Discusses LANL’s COVID-19 Response; How Lab is Adapting to Pandemic](#)

Los Alamos Daily Post—Kirsten Laskey (11/19)

LANL Deputy Director for Operations Kelly Beierschmitt reported to the County Council on how LANL is responding to COVID-19 and adapting to the world that the pandemic has created.

[Editorial: NM Shows Strength in Space](#)

Albuquerque Journal (11/19)

The Perseverance rover that’s scheduled to land on Mars on Feb. 18 is loaded with technology developed in New Mexico. The rover’s laser, sensing and detection devices were built by Los Alamos National Laboratory in collaboration with partners like SolAero Technologies Corp. of Albuquerque.

[ABQ Biotech Firm Hires Veteran Industry Executive](#)

Journal—Kevin Robinson-Avila (11/23)

Sandia Biotech Inc. has hired veteran industry executive Steven Miller to help take medical diagnostics technology licensed from Los Alamos National Laboratory and the University of New Mexico to market.

[DisrupTECH Features Superior Plastics Recycling, Smart Software, Predictive Mapping](#)

Los Alamos Reporter (11/23)

Cutting-edge technologies ranging from more effective plastics recycling to using AI for systems monitoring were recently showcased by a select group of Los Alamos National Laboratory scientists to businesses and investment groups as part of the Laboratory’s annual DisrupTECH event.

[Los Alamos Science Shows Improvements in Shale Natural Gas Production](#)

Shale Magazine—Nick Vaccaro (11/23)

Questioning the current consensus of how methane is captured in rock, a [Los Alamos Laboratory](#) research team released a more efficient approach to retrieving that advantageous gas.

[Los Alamos Scientists Say Their New Technology Could Cut Methane Emissions by 90%](#)

Forbes (11/23)

Lead scientist Manvendra Dubey and his two Los Alamos team members, Bryan Travis and Jeremy Sauer, have already spoken with several potential commercial partners interested in working with them to commercialize the technology.

[Scientists Observe Directed Energy Transport between Neighboring Molecules in a Nanomaterial](#)

PhysOrg (11/23)

The study, led by Antonietta De Sio, University of Oldenburg, and Thomas Frauenheim, University of Bremen, collaborated with theoretical physicists from Los Alamos National Laboratory, and CNR-Nano, Modena, Italy.

[‘Superbolts’ are Real, and They Flash up to 1,000 Times Brighter Than Regular Lightning](#)

Live Science (11/23)

“We focused on superbolts that are substantially brighter than normal lightning — at least 100 times more energetic — and then looked at the top pulses above that threshold, said Michael Peterson, lead author on both studies and a remote-sensing researcher at Los Alamos National Laboratory.

[An Early Mutation May Have Made the Pandemic Harder to Stop](#)

New York Times—James Glanz, Benedict Carey and Hannah Beech (11/24)

For months, scientists have been [fiercely debating](#) why [the virus spread more easily]. Researchers at Los Alamos National Laboratory [argued](#) in May that the variant had probably evolved the ability to infect people more efficiently.